

MS-302

CLOCK SOURCE

OPERATIONS MANUAL

FORM 0212-1182E

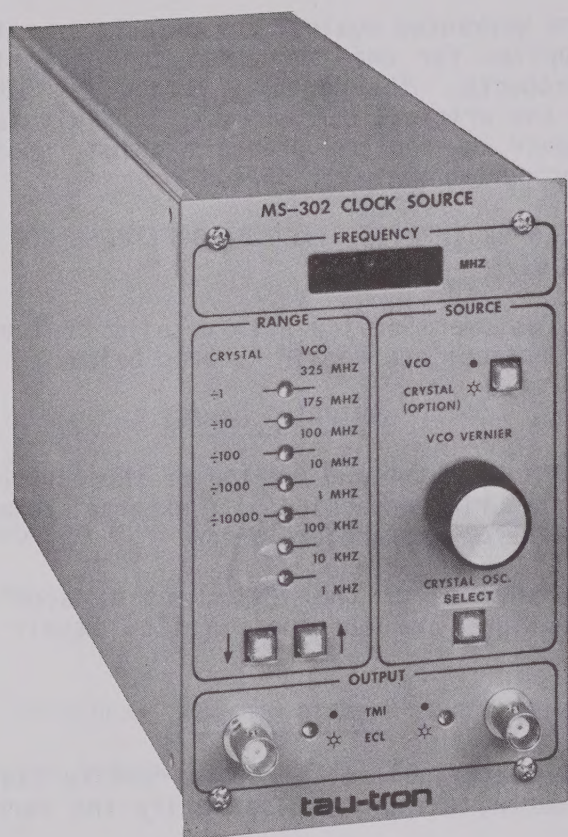
MS-302
PART NO. 8200-0107

tau-tron

A UNIT OF
GENERAL SIGNAL







MS-302

CLOCK SOURCE

OPERATIONS MANUAL

FORM 0212-1182E

WARRANTY

All Tau-tron products are warranted against any defects in material and workmanship. This warranty applies for one year from the date of delivery for all Tau-tron manufactured products. The warranty period for OEM products sold by Tau-tron will depend on the original OEM warranty (consult factory for specific products). We will repair or replace products which, upon our examination, prove to be defective during the warranty period.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE, IS GIVEN.

For assistance, contact Customer Service with details of the instrument model, serial numbers, and malfunction; see Repair Returns below.

SHIPPING DAMAGE

If any signs of damage are noted on the outside of the carton, request that the carrier's agent be present during unpacking. If external damage is found on the instrument, follow Repair Returns procedure below.

Check the electrical performance of the instrument as soon as possible after receipt. If any malfunctions are observed, follow Repair Returns procedure below.

REPAIR RETURNS

For mechanical damage or electrical malfunctions, notify Tau-tron immediately. If the damage occurred during shipping, also notify the carrier. To return a unit for repair:

1. Call the Customer Service Department, (617) 692-5100, for a Repair Authorization Number. This will reduce administrative delays and ensure prompt return of your unit.
2. Complete and attach the Repair Tag, in the rear of the manual, to your unit for positive identification.
3. Pack the unit in the original shipping carton and packing materials, if available. Otherwise use a double-walled carton (test strength of 350 lb; 159 kg) and shock-absorbing material such as bubblewrap to prevent the unit from moving in the carton during transit. Secure the carton by sealing with heavy paper tape.
4. Send to: Tau-tron Inc.
10 Lyberty Way
Westford, MA 01886
Attn: Customer Service

The MS-302 CLOCK SOURCE Operations Manual is provided in modular form so that it can be tailored to your particular system.

The manual for this module is complete in itself and contains information required to install and operate the module.

CONTENTS

PAGE

3. MS-302 CLOCK SOURCE

3.1 Description	3-1
3.2 Specifications	3-2
3.3 Installation	3-3
3.4 Front Panel	3-4
3.5 Operation	3-6
3.5.1 Output Level Setting	3-6
3.5.2 Continuous Frequency Select	3-6
3.5.3 Crystal Frequency Select	3-7
3.6 Theory of Operation	3-8
3.6.1 Clock Source Board	3-8
3.6.2 Front-Panel Display Board	3-8
3.6.3 Module Power Supplies	3-9
3.7 GPIB Option	3-10
3.8 Service	3-11
3.8.1 Routine Service	3-11
3.8.2 Repair Returns	3-11
3.8.3 Assistance	3-12
3.8.4 Trouble Analysis	3-12

7. PARTS

7.1 Replaceable Parts	7-1
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8. DIAGRAMS

8.1 General	8-1
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3. MS-302 CLOCK SOURCE

3.1 DESCRIPTION

The MS-302 Clock Source is a quarter-size TMI module that generates a clock signal variable from 1kHz to 325MHz. This module is designed for use in Tau-Tron Modular Instrumentation (TMI).

Voltage-controlled oscillators and frequency dividers are used to generate the continuously variable output frequency. In addition, up to three separate crystal frequencies may be specified as an option for applications where high stability, fixed frequency signals are required.

A six-digit display inducts the output frequency, other features include dual outputs with selectable output signal levels and GPIB which is available as an option.

The MS-302 requires the Tau-Tron MF-5 Mainframe for operating voltages and cooling.

3.2 SPECIFICATIONS

Frequency Range	1kHz to 325MHz, variable using coarse range select and VCO tuning for continuous coverage.
Crystal Options	From one to three different crystals may be ordered, the frequency may be selected in the range of 1kHz to 325MHz. Options: OP-04-X: Crystal Oscillator (X = specific frequency or frequencies).
Output signal	Amplitude: Selectable, 1V into 50 ohms to ground (TMI) or ECL into 50 ohms to -2V. An internally mounted select switch is used. Rise/Fall Time: 1 ns max., 500 ps typical (10%-90%) $\pm 7\%$ max. distortion when driving 50 ohm DC load. Waveshape: Squarewave.
Output Channels	Two identical output amplifiers drive the BNC front-panel connectors. Each channel has independent selection of output amplitude.
Options	OP-02 IEEE-488 Interface (GPIB) OP-04-X Crystal Oscillator (X=specific frequency or frequencies).
Power	+34V -34V +17V -17V
Cooling	Forced air, supplied by mainframe.
Mechanical	TMI quarter-size module. DIMENSIONS: 6.375 in. high x 4 in. wide x 11 in. deep. WEIGHT: 2 lb net, 5 lb shipping.

3.3 INSTALLATION

Module 1. Pull out the Module Lock knob on the MF-5.

Insertion 2. Insert the module as required.

3. Push in the Module Lock knob.

The module(s) can be inserted in any position desired. In general, systems shipped by Tau-Tron have modules inserted in the following order:

Position 1...Clock

Position 2...Transmitter

Position 3...Receiver

Module 1. Pull out the Module Lock knob.

Removal 2. Grasp the module to be removed by its front-panel thumbscrews and pull to remove.

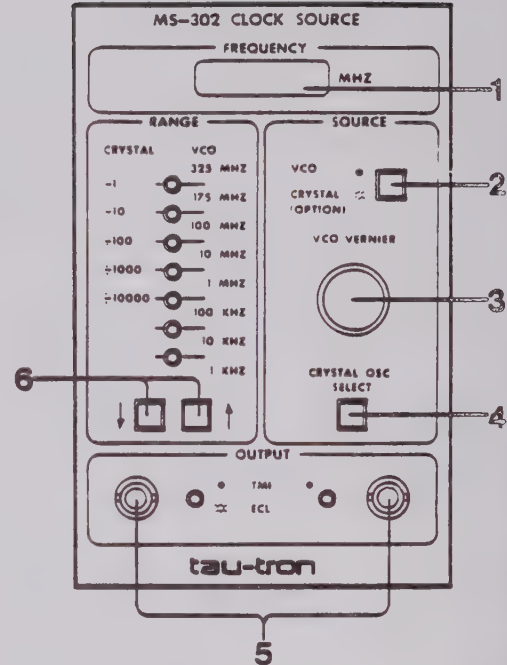
3. Push in the Module Lock knob to prevent the remaining modules from accidentally falling out.

Crystal When two or more crystal-controlled oscillators are installed, only
Oscillator one at a time can be placed in-circuit by the front-panel VCO crystal
Selection switch.

Interconnec- The MS-302 OUTPUT is normally connected to the input of a generator
tions by means of a 50-ohm BNC cable of the shortest practical length.

3.4 FRONT PANEL

- 1 **FREQUENCY** Six-digit LED display shows the frequency of the signal at the output jack. The frequency is shown as "XXX.XXXMHz".
- 2 **VCO/CRYSTAL (Option)** Illuminated pushbutton selects the source of the output signal between the internal voltage controlled oscillator or one of three specified crystal oscillators. The pushbutton is not lit when VCO is selected but lit when crystal is selected. The crystal-controlled mode of operation is optional (OP-04-X) and can include up to three crystal-controlled oscillators. Only one of three oscillators at a time can be placed in circuit by the VCO CRYSTAL switch.
- 3 **VCO VERNIER** Control knob sets the output frequency in the VCO mode. The range of this control is from less than 100MHz to greater than 325MHz in two steps. In all other selections the control covers a 10 to 1 frequency range.
- 4 **CRYSTAL OSC. SELECT** Pushbutton indicator selects one of three internal crystal oscillators when the Crystal Source is selected. Push the button until the proper frequency is shown on the FREQUENCY DISPLAY to get the desired crystal.
- 5 **OUTPUT** Two BNC connectors provide simultaneous output signals. Internally mounted printed-circuit board switches allow the selection of two output levels. In the TMI mode (indicators not lit) the signal amplitude is 1V into 50 ohms to ground terminating resistor.



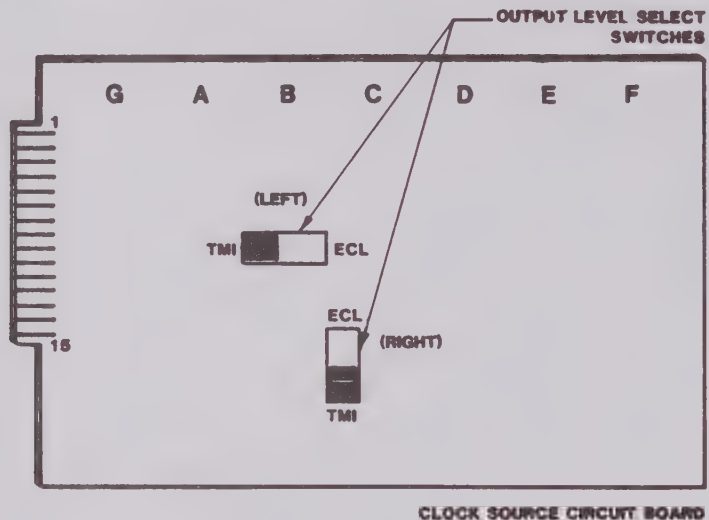
In the ECL mode (indicators lit) the signal swing is compatible with ECL circuit inputs. The termination must be 50 ohms to -2V. In either case the rise and fall times are typically 500 pico-seconds.

- 6 Range Two illuminated pushbuttons set the VCO tuning range at the output.
- Increment/ The selected range is indicated by an illuminated LED. When in the
- Decrement CRYSTAL mode, one of five dividers may be selected ($\div 1$, $\div 10$, $\div 100$,
- Select $\div 1000$, and $\div 10000$). In all cases the frequency at the module output is displayed.

3.5 OPERATION

3.5.1 OUTPUT LEVEL SELECT

Remove the module from the mainframe, the OUTPUT LEVEL SELECT switches are located on the Clock Source circuit board. Each channel may be independently selected by means of the two printed circuit mounted slide switches. Make the proper level selection, return the module to the mainframe.



3.5.2 CONTINUOUS FREQUENCY SELECT

Any output frequency between 1kHz and 325MHz can be selected as follows:

1. Set the VCO/CRYSTAL pushbutton to VCO.
2. Set the RANGE with the range select pushbuttons as determined by the associated VCO RANGE display.
3. Set the VCO VERNIER control to the desired frequency as shown on the FREQUENCY display.

3.5.3 CRYSTAL FREQUENCY SELECT

1. Set the VCO/CRYSTAL pushbutton to CRYSTAL the pushbutton should latch and the LED should be ON.
2. Set the RANGE control pushbuttons to the desired crystal divisor as determined by the CRYSTAL DIVISOR table, $\div 1$; $\div 10$; $\div 100$; $\div 1000$; $\div 10000$.
3. Select the desired crystal frequency (in case of more than one crystal oscillator) using the CRYSTAL OSC. SELECT pushbutton. Check the selected oscillator by observing the FREQUENCY display.

NOTE: The FREQUENCY display always reads the final output frequency, if a crystal divisor other than -1 is selected, the display will show the divided frequency.

3.6 THEORY OF OPERATION

3.6.1 CLOCK SOURCE BOARD

The MS-302 uses two voltage controlled oscillators (VCOs) and a series of decade dividers to generate the output frequency. One of the oscillators covers a 2:1 frequency range of about 175 to 350MHz, this provides the highest frequency range of 325MHz. A divide-by-two circuit at the VCO output generates the next lowest range of 100 to 175MHz. Because of the divide-by-two at this point, the actual frequency range is actually about 85 to 175MHz.

The second VCO tunes a 10:1 range from 10 to 100MHz, decade frequency dividers are then used to select the remaining frequency bands.

The RANGE Select pushbuttons control an up-down binary counter whose outputs drive the select lines of an 8 to 1 multiplexer/selector.

It should be noted that, in order to minimize signal interference from unused oscillators, the unused oscillators are shut off by removing the DC voltage from the oscillator input.

The Crystal Oscillators are selected by a similar counting circuit and a 3 to 1 multiplexer/selector which enables only one crystal oscillator at a time. All other crystal oscillators and the two voltage controlled oscillators are shut off when they are not selected.

The output signals are developed by high-speed micro-circuit switching amplifiers. The output levels are selected by slide switches mounted on the Clock Source printed-circuit board. These amplifiers are DC coupled at the output and must drive DC coupled 50-ohm loads. The load can either be 50 ohms to ground in the case of TMI or 50 ohms to -2 volts in the case of ECL. The important point is that the load must be direct coupled in order to minimize waveshape distortion.

3.6.2 FRONT-PANEL DISPLAY BOARD

A universal frequency counter, LED driven integrated circuit drives the FREQUENCY display. The input to the counter comes from a divide-by-100 circuit at the output of the RANGE SELECTOR so that the displayed value always represents the frequency of the final output signal.

3.6.3 MODULE POWER SUPPLIES

The unregulated mainframe voltages of $\pm 34\text{V}$ and $\pm 17\text{V}$ are the inputs to voltage regulators located on the rear and side of the module. The $+34\text{V}$ and -34V drive $+15$ and -15V regulators with loads of much less than 1A . The $+17\text{V}$ is regulated to $+8\text{V}$ which provides power to the micro-circuit amplifiers and is also the input to a $+5\text{V}$ regulator located on the Clock Source board. This voltage is used for TTL logic circuit power. The -17V is regulated to a -5.2V high current supply using a combination of a three-terminal regulator and boost transistor. This voltage is also used to drive a PC board mounted -2V regulator which supplies the termination voltage for the high-speed ECL circuits.

3.7 GPIB OPTION

General All front-panel controls, except the VCO VERNIER, can be remotely controlled by a GPIB-compatible controller. The controller connects to the rear panel of the MF-5 Mainframe. An associated Address/Control switch, also on the rear panel of the MF-5, must be properly set for the type of operation desired

Message Format The message consists of four digits (in ASCII code) followed by a terminator.

Ident	VCO/ CRYSTAL	CRYSTAL/ VCO RANGE	CRYSTAL OSC SELECT	Termi- nator
-------	-----------------	-----------------------	-----------------------	-----------------

Ident	<u>Digit</u>	<u>Meaning</u>
	1	MS-302 Clock Source

VCO/CRYSTAL	<u>Digit</u>	<u>Meaning</u>
	0	CRYSTAL
	1	VCO

CRYSTAL/ VCO RANGE	<u>Digit</u>	<u>Meaning</u>
	0	175 to 325MHz; or full crystal frequency
	1	100 to 175MHz; or crystal ± 10
	2	10 to 100MHz; or crystal ± 100
	3	1 to 10MHz; or crystal ± 1000
	4	0.1 to 1MHz; or crystal ± 10000
	5	10 to 100kHz; no output in crystal mode
	6	1 to 10kHz; no output in crystal mode
7	Illegal (no output)	

CRYSTAL/ OSC SELECT	<u>Digit</u>	<u>Meaning</u>
	0	1st crystal frequency
	1	2nd crystal frequency
	2	3rd crystal frequency
	3	Illegal (no output)

Terminator Terminators recognized are Comma, CR and LF. Alternatively, an EOI signal may be used as the message terminator.

3.8 SERVICE

DANGER: Hazardous voltages exist in this equipment. Do not attempt access to the interior without first disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

3.8.1 ROUTINE SERVICE

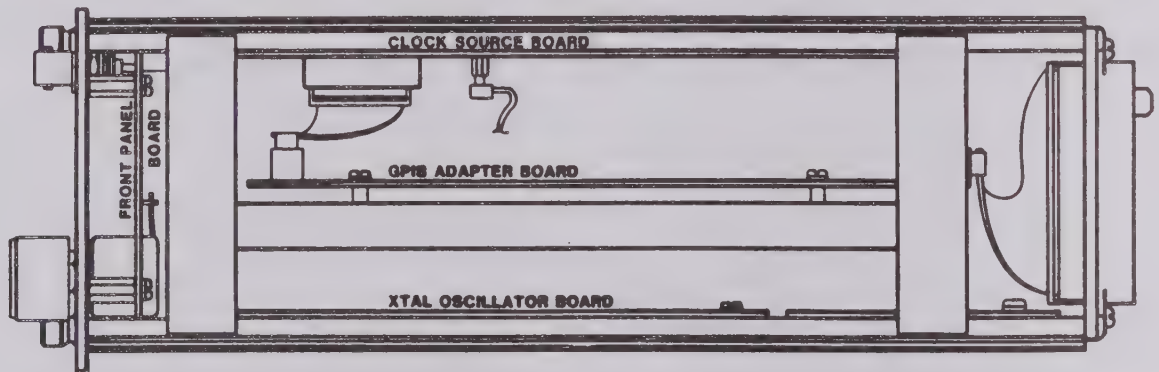
Routine service includes the performance of checks and service procedures which prevent or minimize the downtime of the unit. The checks and service are simplified, and may be limited to visual inspection for defective components, loose hardware and/or accumulation of dust within the unit at critical areas.

NOTE: It is recommended that periodic cleaning (approximately once every three months) of the interior and exterior of the unit be done with a vacuum cleaner.

Refer to Section 3.3, INSTALLATION, for module removal.

Board Seating

Ensure that all printed circuit boards are securely seated in their connectors as shown in the illustration below.



MB-302

3.8.2 REPAIR RETURNS

For mechanical damage or electrical malfunctions, refer to Page ii, REPAIR RETURNS.

3.8.3 ASSISTANCE

For service assistance call the Tau-Tron Customer Service Dept., (617) 256-9013. Their experience and expertise can often save you valuable time in correcting any equipment malfunction.

3.8.4 TROUBLE ANALYSIS

DANGER: Hazardous voltages exist in this equipment. Do not attempt access to the interior without first disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

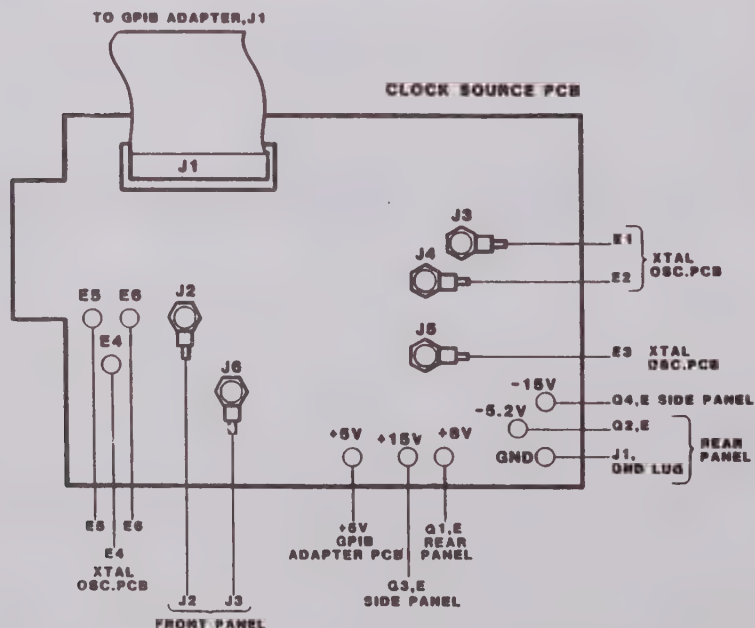
Output Levels

Verify that selected output levels are correct by observing the front panel; TMI output (LED not lit), ECL output (LED lit). Refer to Section 3.5.1 OUTPUT LEVEL SELECT, for proper TMI/ECL settings.

DC Voltages

WARNING: While measuring the -5.2V DC power supply, ensure that utmost care is taken. A power supply could be either severely damaged or completely destroyed if it is accidentally shorted to ground.

Verify that the DC voltages are correct by measuring them on the Clock Source circuit board. Refer to the illustration below for the proper measurement points.



If the correct voltages are not indicated, consult the factory.

Calibration

Routine calibration is not normally required except in the following situations:

- a. Failed component or circuit. Consult factory for further details.
- b. Failure of LED indicator(s) to light if determined to be functional; measure the outputs with an oscilloscope (Tektronix 7104 or equivalent) and verify their signal outputs according to Section 3.2, SPECIFICATIONS. (Consult factory if signal outputs are not correct.)
- c. Harsh environment; typical environment is:
 - Temperature 32 to 95°F (0 to 35°C)
 - Humidity 0 to 95% RH max at 20°C, non-condensing.

Any calibrations or technical adjustments other than the situations mentioned above should not be made during the Warranty period unless otherwise authorized. Consult factory for further details. (Refer to sections 3.2 and 3.5, SPECIFICATIONS and OPERATION, respectively, for proper switch, control, level and LED indicator settings.)

7. PARTS

7.1 REPLACEABLE PARTS

This section contains a listing of all electronic components and mechanical parts subject to normal wearout or failure. In the index shown below, table 7-1 is described. The table references the replaceable parts according to Tau-Tron Part no., description and quantity required.

<u>Table</u>	<u>Description</u>	<u>Page</u>
7-1	MS-302 Clock Source	7-3

TABLE 7-1
MS-302
Clock Source

MS302 CLOCK SOURCE

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
8000-0043	SCREW PNHD MET NO.4-40X1/4	6.000
8000-0071	SCREW PNHD MET NO.5-40X1/4	6.000
8000-0072	SCREW PNHD MET NO.5-40X3/8	8.000
8000-1202	LOCKWASHER NO.4 INT TIGHT	6.000
8000-1203	LOCKWASHER NO.5 INT TIGHT	6.000
8000-9020	MODULE THUMBSCREW B-63013	2.000
9303-0004	PIN RECEPTACLE SNAP-ON	6.000
9515-4496	MS302 FRONT PANEL ASSY	1.000
9525-4496	MS302 REAR PANEL ASSY	1.000
9535-4496	MS302 ECCST TRNSTR PANEL ASSY	1.000
9545-4514	MS302 CLOCK SOURCE PCB ASSY	1.000
9545-4517	MS302 XTAL CSC PCB ASSY	1.000
9555-4567	CABLE ASSY COAXIAL	3.000
9705-4410	MODULE SIDE COVER	1.000
9705-4528	BERTS 325 MODULE RAILS	1.000

MS302 FRCNT PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0333-4100E	RES VAR 1 KCHM 10P 1/2A	1.000
8000-0043	SCREW PHHC MET NO.4-40X1/4	4.000
8000-1202	LOCKWASHER NO.4 INT TCOIT	4.000
9303-0004	PIN RECEPTACLE SNAP-CN	8.000
9545-4495	MS302 FRONT PANEL PCB ASSY	1.000
9555-4562	CABLE ASSY COAXIAL	2.000
9705-4490	MS302 FRONT PANEL FINISHED	1.000
9725-4492	MS302 DISPLAY WINDOW	1.000
9735-6414	SPACER MET HEX 0.531 LG	4.000
9801-672AM	KNCE .920 X .64LG BLK 1/4 SHFT	1.000

MS302 REAR PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0022-2120	RES CCMP 12 CHM 5F 1/4W	1.000
0022-3150	RES CCMP 150 CHM 5F 1/4W	1.000
0022-3300	RES CCMP 300 CHM 5F 1/4W	2.000
1014-4610	CAP CER 0.1 MFD 20P 200V	1.000
1024-5110	CAP ELEC 1 MFD 35WVDC	2.000
1024-5147	CAP ELEC 4.7 MFD 20P 35WVDC	1.000
1024-5210	CAP ELEC 10 MFD 35WVDC	2.000
2101-4001	DIODE RECTIFIER 1N4001	2.000
4200-340K5	IC LINEAR REGULATOR LM340K5	1.000
4201-320K5	IC LINEAR REGULATOR LM320K5	1.000
8000-0045	SCREW PNHC MET NO.4-40X3/8	6.000
8000-0808	SCREW SLF-TAP 6 X 1/2 TYPE B	4.000
8000-1202	LOCKWASHER NO.4 INT TCCTH	1.000
8000-1506	LUG SOLDER ANGLE NO.4	5.000
8000-6000	BUSHING INSULATING TC-3	4.000
8000-6001	WASHER INSULATING TC-3	2.000
8000-6002	SOCKET TO-3 MOUNTING	2.000
9300-0103	CONN PLUG PANEL MNT 24 PCS	1.000
9705-4448	MODULE 4IN REAR PANEL MACHINED	1.000

MS302 BCCST TRNSTR PANEL ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0022-1300	RES CCMP 3 CHM SP 1/4W	1.000
1014-4610	CAP CER 0.1 MFD 20P 200V	1.000
1024-5110	CAP ELEC 1 MFD 35WVDC	2.000
1024-5147	CAP ELEC 4.7 MFD 20P 35WVDC	1.000
3180-3055	TRNSTR NPN POWER 2N3055	1.000
4200-340K15	IC LINEAR REGULATOR LM340K15	1.000
4201-320K15	IC LINEAR REGULATOR LM320K15	1.000
8000-0047	SCREW PHHD MET NO.4-40X1/2	6.000
8000-0808	SCREW SLF-TAP 6 X 1/2 TYPE 8	6.000
8000-1002	NUT HEX MET NO.4-40	6.000
8000-1202	LOCKWASHER NO.4 INT TCCTH	2.000
8000-1506	LUG SOLDER ANGLE NO.4	4.000
8000-6000	BUSHING INSULATING TC-3	6.000
8000-6001	WASHER INSULATING TC-3	3.000
8000-6002	SOCKET TC-3 MOUNTING	3.000
9705-4174	BCCST TRNSTR PANEL	1.000

MS302 FRONT PANEL PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0022-3100	RES CCMP 100 OHM 5P 1/4W	1.000
0022-3220	RES CCMP 220 OHM 5P 1/4W	8.000
0022-3300	RES CCMP 300 OHM 5P 1/4W	2.000
0022-4100	RES CCMP 1 KOHM 5P 1/4W	2.000
0022-5100	RES CCMP 10 KOHM 5P 1/4W	4.000
0022-8220	RES CCMP 22 MCHM 5P 1/4W	1.000
1013-8510E	CAP CER .01 MFD 20P 100V 0.1SP	2.000
1042-9256	CAP MICA 56 PF 5P 500V	1.000
1059-8260	CAP VAR 15-60 PF PC MNT 200V	1.000
1064-1233	CAP MIN-TANT 33 MFD 10WVCC	2.000
2112-4148	DIODE GEN PURPOSE IN4148	1.000
2274-5374	DIODE LED YELLOW MV5374C	9.000
3224-4403	TRNSTR NPN AMPLIFIER 2N4403	2.000
4012-7445	IC TTL SN7445N PLSTC	1.000
4074-7216C	IC DISPLAY/DRIVER ICM7216D	1.000
4513-7433	IC DISPLAY ARRAY HPS082-7433	2.000
6000-6116	XTAL 10.000 MHZ	1.000
6900-0000	XTAL SOCKET HC-25/U	1.000
8000-0001	SCREW PHHD MET NC.2-56X1/4	1.000
8000-1000	NUT HEX MET NO.2-56	1.000
8000-1200	LOCKWASHER NC.2 INT TCCTH	1.000
8000-2903	SPACER NYLON 3/16OD X 7/16LG	9.000
9205-0011	SWITCH PB MAINTAINED LTD YEL	1.000
9205-0019	SWITCH PB MOMENTARY NO LED	3.000
9300-0138	SOCKET IC 28 PIN LOW PROFILE	1.000
9300-0148	SOCKET STRIP 12 PIN	2.000
9300-0149	CONN EDGE DUAL 15 PCS PC MNT	1.000
9303-0003	CONN POST MALE	4.000
9605-4494	MS302 FRONT PANEL PCB	1.000

MS302 CLOCK SOURCE PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0012-1560	RES CCMP 5.6 OHM 5% 1/8W	2.000
0012-2150	RES CCMP 15 OHM 5% 1/8W	2.000
0012-2350	RES CCMP 39 OHM 5% 1/8W	1.000
0012-2470	RES CCMP 47 OHM 5% 1/8W	2.000
0012-2510	RES CCMP 51 OHM 5% 1/8W	2.000
0012-2820	RES CCMP 82 OHM 5% 1/8W	2.000
0012-3100	RES CCMP 100 OHM 5% 1/8W	38.000
0012-3120	RES CCMP 120 OHM 5% 1/8W	1.000
0012-3130	RES CCMP 130 OHM 5% 1/8W	2.000
0012-3150	RES CCMP 150 OHM 5% 1/8W	2.000
0012-3160	RES CCMP 160 OHM 5% 1/8W	4.000
0012-3270	RES CCMP 270 OHM 5% 1/8W	4.000
0012-3470	RES CCMP 470 OHM 5% 1/8W	12.000
0012-3510	RES CCMP 510 OHM 5% 1/8W	1.000
0012-4100	RES CCMP 1 K OHM 5% 1/8W	6.000
0012-4200	RES CCMP 2 K OHM 5% 1/8W	4.000
0012-4510	RES CCMP 5.1 K OHM 5% 1/8W	1.000
0012-4750	RES CCMP 7.5 K OHM 5% 1/8W	1.000
0012-5100	RES CCMP 10 K OHM 5% 1/8W	4.000
0012-5150	RES CCMP 15 K OHM 5% 1/8W	4.000
0012-5200	RES CCMP 20 K OHM 5% 1/8W	3.000
0022-2750	RES CCMP 75 OHM 5% 1/4W	1.000
0022-3120	RES CCMP 120 OHM 5% 1/4W	1.000
0333-2100	RES VAR 10 OHM 10% 1/2W	2.000
0333-3500J	RES VAR 500 OHM 10% 1/2W	2.000
0333-4100	RES VAR 1 K OHM 10% 1/2W	3.000
0333-4100T	RES VAR 1 K OHM 10% 1/2W	5.000
0333-4500	RES VAR 5 K OHM 10% 1/2W	1.000
0333-5100	RES VAR 10 K OHM 10% 3/4W	1.000
0333-5100C	RES VAR 10 K OHM 10% 1/2W	1.000
1014-4610	CAP CER 0.1 MFD 20% 200V	1.000
1024-5110	CAP ELEC 1 MFD 35WVDC	3.000
1064-1233	CAP MIN-TANT 33 MFD 10WVDC	2.000
1064-4210	CAP MIN-TANT 10 MFD 25WVDC	1.000
1084-4710	CAP CHIP .01 MFD 50WVDC	105.000
2112-4148	DIODE GEN PURPOSE 1N4148	1.000
2143-1403	DIODE VARACTOR MV1403	2.000
4012-10124	IC ECL MC10124P PLSTC	2.000
4012-10125	IC ECL MC10125P PLSTC	1.000
4012-10138	IC ECL MC10138P PLSTC	4.000
4012-1658L	IC ECL MC1658L CER	1.000
4012-4000	IC CMOS MC14000BCP PLSTC	1.000
4012-4490	IC CMOS MC14490ECP PLSTC	1.000
4012-74LS00	IC TTL SN74LS00N PLSTC	1.000
4012-74LS138	IC TTL SN74LS138N PLSTC	1.000
4012-74LS151	IC TTL SN74LS151N PLSTC	1.000
4012-74LS157	IC TTL SN74LS157N PLSTC	1.000
4012-74LS193	IC TTL SN74LS193N PLSTC	2.000

MS302 XTAL OSC PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0012-2390	RES CCMP 39 OHM 5P 1/8W	3.000
0012-3150	RES CCMP 150 OHM 5P 1/8W	6.000
0022-2100	RES CCMP 10 OHM 5P 1/4W	3.000
1013-8510E	CAP CER .01 MFD 20F 100V 0.1SP	3.000
1064-4210	CAP MIN-TANT 10 MFD 25WVDC	2.000
7000-0001	RELAY 8 PIN DIP 02ACS	3.000
8000-1004	NUT HEX MET NO.6-32	12.000
8000-1204	LOCKWASHER NO.6 INT TCOTH	12.000
8000-1304	FLAT WASHER MET NO.6	12.000
9300-0150	PRINTED WIRING CONTACTS	15.000
9303-0003	CONN POST MALE	6.000
9605-4516	MS302 XTAL OSC PCB	1.000

MS302 GPIB OPTION KIT

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
8000-0043	SCREW PNHC MET NC.4-40X1/4	4.000
8000-0047	SCREW PNHC MET NC.4-40X1/2	2.000
8000-0614	SCREW FLTHC MET NC.4-40X5/16	12.000
8000-1002	NUT HEX MET NC.4-40	2.000
8000-1202	LOCKWASHER NC.4 INT TCOOT	6.000
8000-1302	FLAT WASHER MET NC.4	2.000
9545-4541	MS302 GPIB ADAPTER PCB ASSY	1.000
9555-4440	CABLE ASSY FLAT 50 PCS	1.000
9555-4552	CABLE ASSY FLAT 20 PCS	1.000
9705-4434	PC CARD HOLDER BRACKET	2.000
9705-4486	PC HOLDER BRACKET	4.000

MS302 GPIB ADAPTER PCB ASSY

COMPONENT ITEM NO.	DESCRIPTION	QUANTITY PER
0012-4300	RES COMP 3 KCHM 5% 1/8W	7.000
1013-8510E	CAP CER .01 MFD 20P 100V 0.1SF	13.000
1054-1233	CAP MIN-TANT 33 MFD 10WVCC	1.000
4012-74LS00	IC TTL SN74LS00N PLSTC	1.000
4012-74LS04	IC TTL SN74LS04N PLSTC	1.000
4012-74LS157	IC TTL SN74LS157N PLSTC	2.000
4012-74LS174	IC TTL SN74LS174N PLSTC	2.000
4012-7485	IC TTL SN7485N PLSTC	1.000
9303-0003	CONN POST MALE	2.000
9306-0039	CONN PCB HDR MALE 50 POS	1.000
9306-0044	CONN PCB HDR MALE RTAGL 20 PCS	1.000
9314-0011	STIK POST C.10 CTRS	3.000
9314-0012	JUMPER FOR STIK PCST C.10 CTRS	3.000
9605-4482	GPIB ADAPTER PCB	1.000

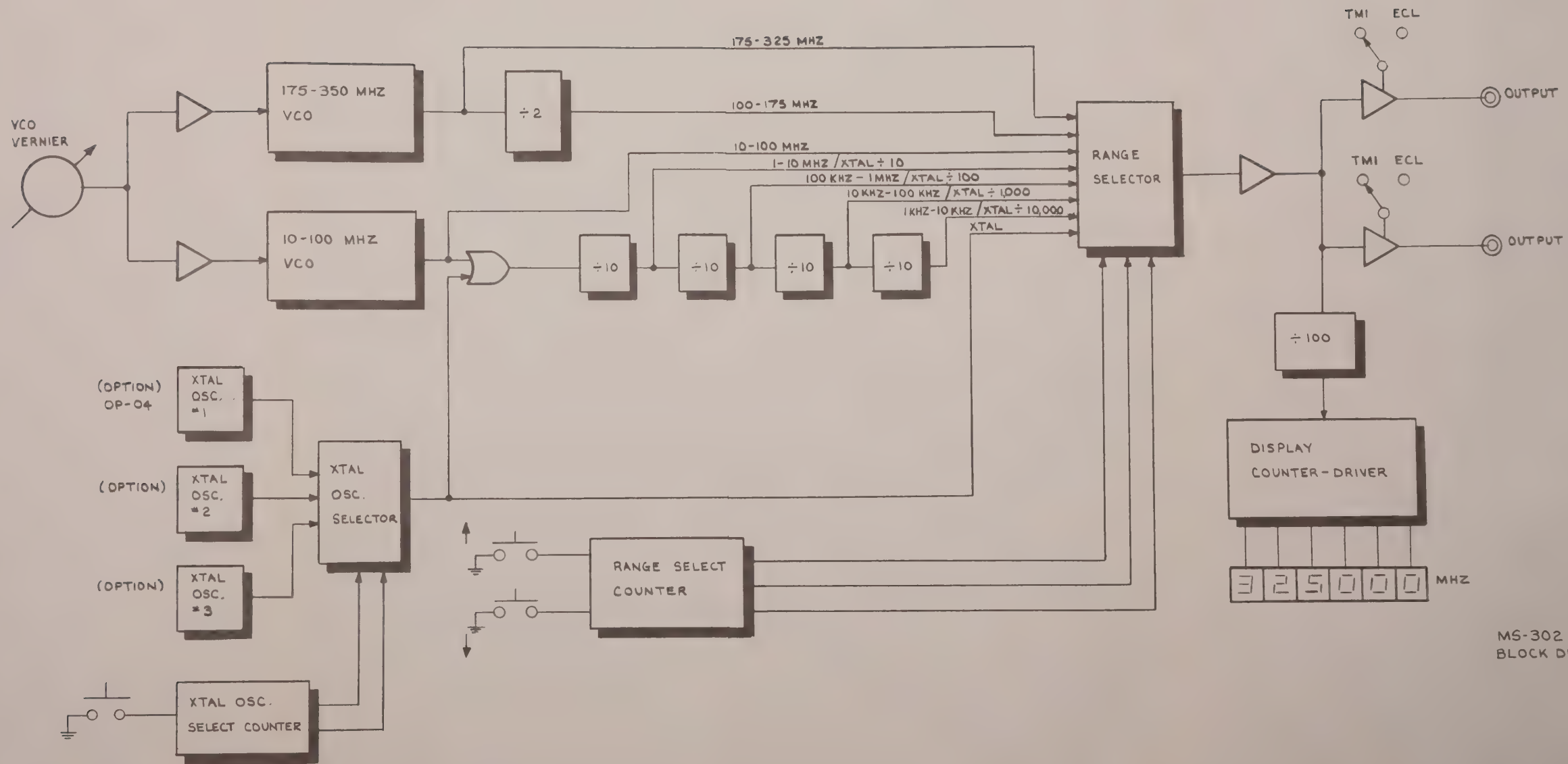
8. DIAGRAMS

8.1 GENERAL

This section contains Block and Schematic diagrams for the MS-302 module. Figures are given in the table below.

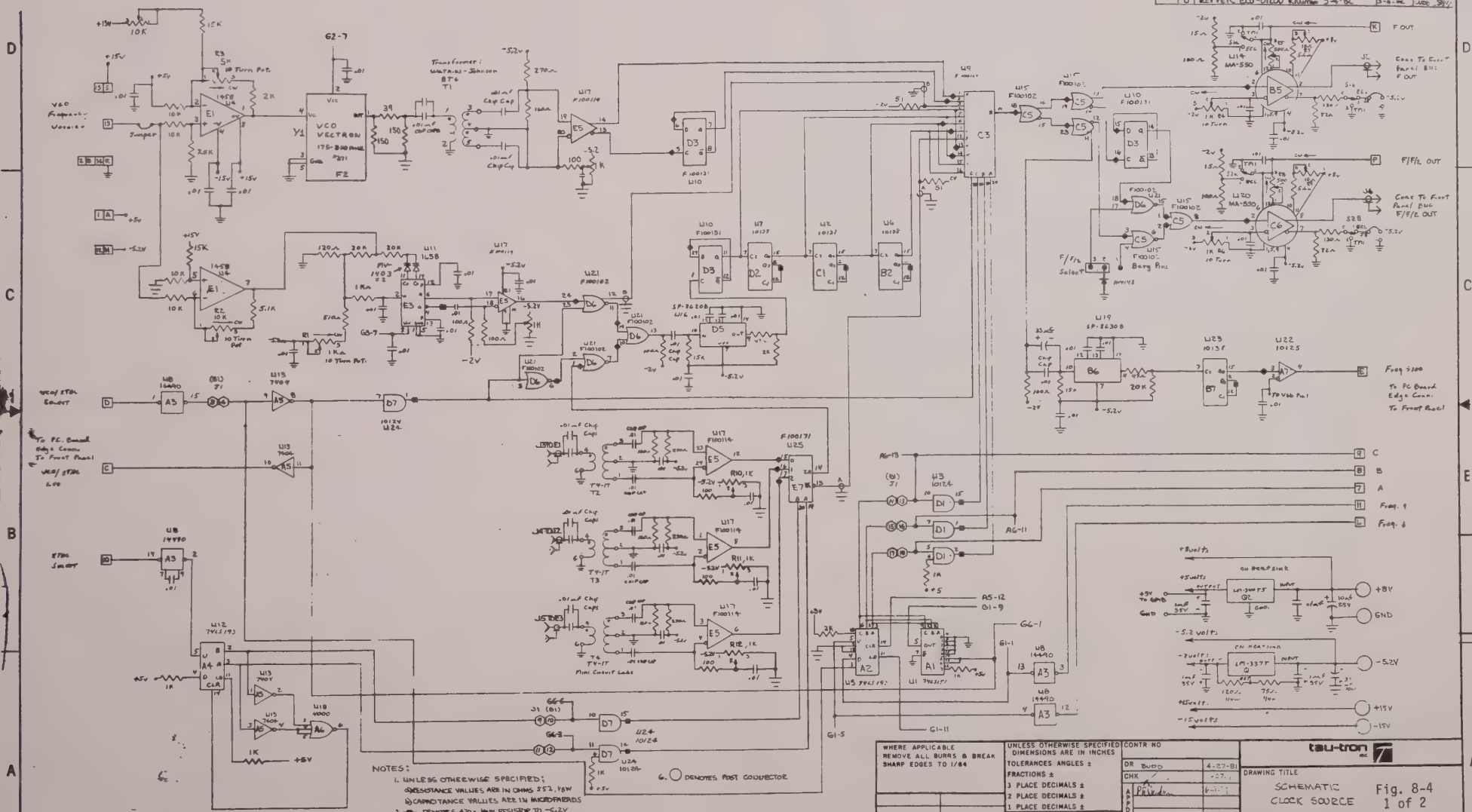
TABLE 8-1
DIAGRAMS

<u>Figure</u>	<u>Description</u>
8-2	MS-302 Block Diagram
8-3	MS-302 Front-Panel Schematic
8-4	MS-302 Clock Source Schematic
8-5	MS-302 Crystal Oscillator Schematic
8-6	MS-302 Power Supply Schematic
8-7	MS-302 GPIB Adapter Schematic



MS-302
BLOCK DIAGRAM

REVISIONS			
ZONE	DATE	DESCRIPTION	APPROVED
2	REVISED PER ECD 00931	WCR	P-11-81
A	REV PER ECO 01037	WAB 11-20-81	12-11-81
B	REV PER ECD 01100	BAJ 12-24-81	3-8-82



- NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE VALUES ARE IN OHMS 252, 15W
b) CAPACITANCE VALUES ARE IN MICROFARADS
 2. DENOTES 470K 10W RESISTOR TO -5.2V
 3. DENOTES 100K 10W RESISTOR TO -2V
 4. DENOTES EDGE CONNECTOR PIN NUMBER OR LETTER
 5. DENOTES 20 PIN CONNECTOR
 6. E1-E3 TESTED XTAL OSCILLATOR (TOL-54515)
6. DENOTES POST CONNECTOR

WHERE APPLICABLE REMOVE ALL BURNS & BREAK SHARP EDGES TO 1/64		UNLESS OTHERWISE SPECIFIED CONTR NO DIMENSIONS ARE IN INCHES	
TOLERANCES: ANGLES ± FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± 1 PLACE DECIMALS ±		MATERIAL	
TDC-54514 MS-502		DRAWING TITLE	
NEXT ASSY USED ON		SCHEMATIC Fig. 8-4	
APPLICATION		CLOCK SOURCE 1 of 2	
APPROVED		SIZE CODE IDENT NO DRAWING NO	
BY DIRECTION OF		D TW-54512	
		REV E	
		SCALE 1/8"=1"	
		SHEET 1 OF 2	

5

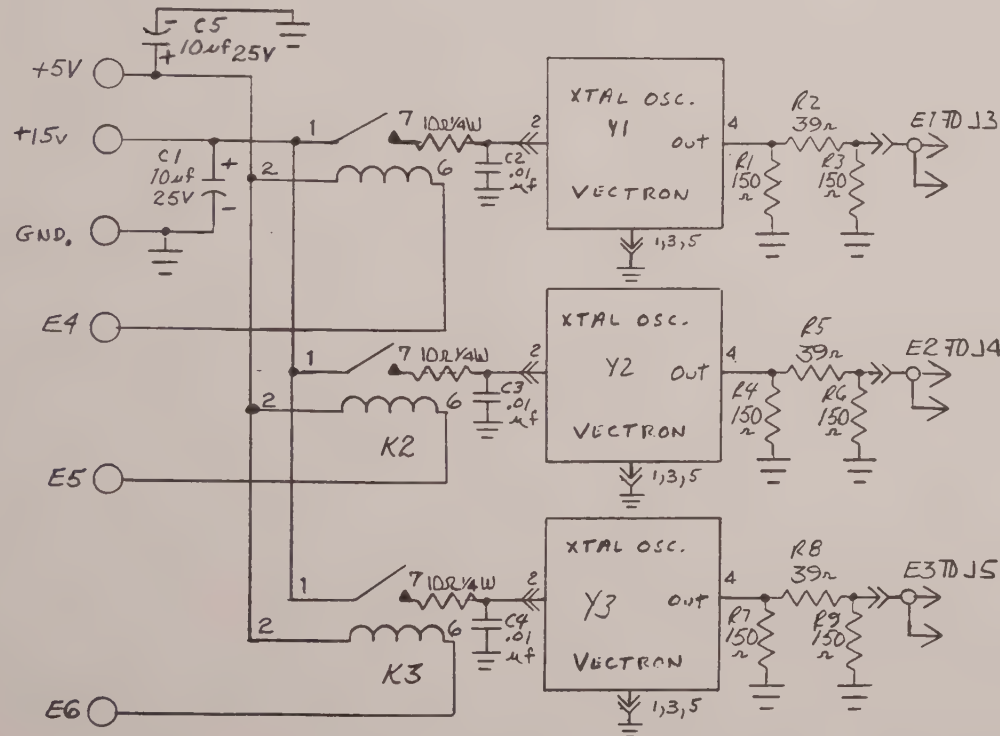
4

3

2

1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	0	ORIGINATED	4-27-81	
	1	UPDATED PROTOTYPE <i>8J4-29-81</i>	5-11-81	<i>AP</i> <i>CE</i>
	2	REV PER ECO/00979 <i>29 JULY 81</i>	7-4-81	<i>AP</i> <i>DAP</i>
	A	REV PER ETD-01100 <i>REVISED 3-4-82</i>	3-4-82	<i>BADD</i> <i>AP</i>



NOTES:

1. COAX HARD SOLDERED TO PC BOARD (3 PLACES)
2. J3 - J5 ON CLOCK SOURCE (TDJ-54512)

WHERE APPLICABLE:
REMOVE ALL BURRS & BREAK
SHARP EDGES TO 1/64.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

TOLERANCES: ANGLES ±

FRACTIONS ±

3 PLACE DECIMALS ±

2 PLACE DECIMALS ±

1 PLACE DECIMALS ±

MATERIAL:

MS-302

NEXT ASSY

USED ON

APPLICATION

CONTR NO.

DR *SA MacLennan*

CHK *AP*

AP *AP*

PD

APPROVED

BY DIRECTION OF

tau-tron
inc

DRAWING TITLE SCHEMATIC
XTAL OSCILLATOR

Fig. 8-5
1 of 1

SIZE
B

CODE IDENT NO.

DRAWING NO.

TBJ-54515

REV

A

SCALE

1

MS-302

SHEET 1 OF 1

5

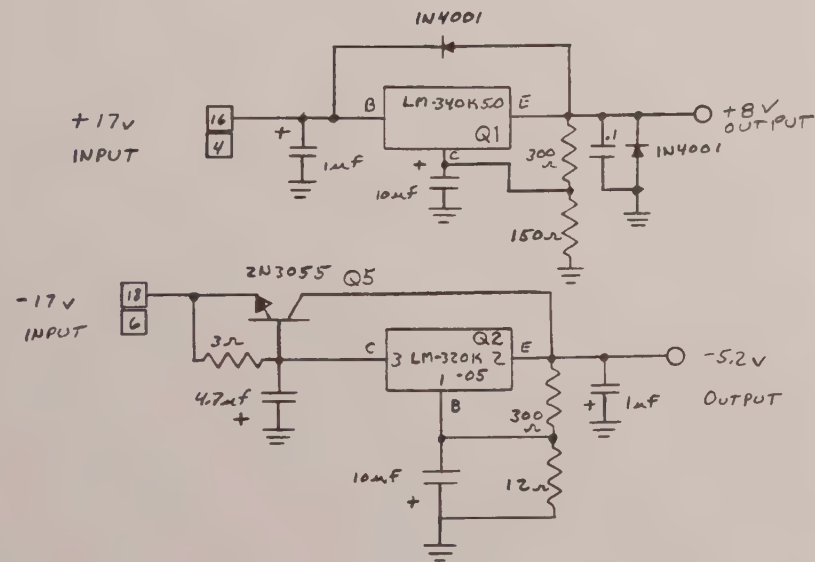
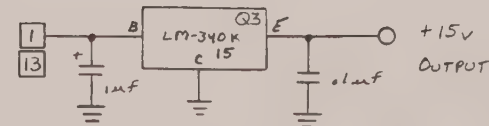
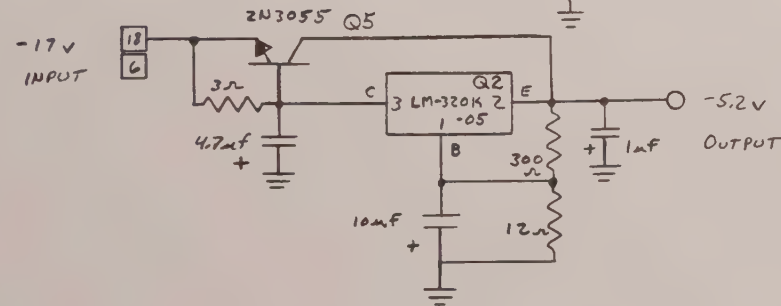
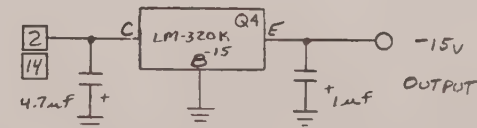
4

3

2

1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	1	UPDATED PROTOTYPE <i>ECO/COB78</i> <i>29 JUL 81</i>	8-2-81	<i>PP</i>
	A	ECO # 01024	9-25-81	AAM

+34V
INPUT-34V
INPUT

WHERE APPLICABLE:
REMOVE ALL BURRS & BREAK
SHARP EDGES TO 1/64.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES

TOLERANCES: ANGLES ±

FRACTIONS ±

3 PLACE DECIMALS ±

2 PLACE DECIMALS ±

1 PLACE DECIMALS ±

MATERIAL:

NEXT ASSY USED ON

APPLICATION

CONTR NO.

DR *SAM* *4-27-81*

CHK

APP

D

APPROVED

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inc

DRAWING TITLE

MS-302 Power Supply

Fig. 8-6
1 of 1

SIZE

B

CODE IDENT NO.

DRAWING NO.

TBJ-54511

REV

A

SCALE

—

SHEET 1 OF 1

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application _____
is _____

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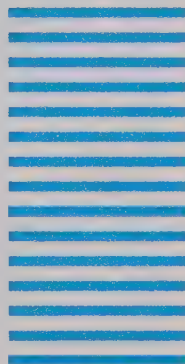
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3. **Pack the unit** in the original shipping carton and packaging materials, if available. Otherwise use a double-walled carton (test strength of 350 lb) and shock absorbing material such as bubble wrap to prevent the unit from moving in the carton during transit. Seal with heavy paper tape.
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10 Lyberty Way
Westford, MA 01886
attn: Customer Service

Repair Tag

Repair Authorization Number _____

Model

Serial

Number

--	--	--	--	--	--	--	--

☐ Warranty repair ☐ Dead on arrival ☐ Repair ☐ Modification ☐ Recalibration

Symptoms: _____



Name _____ Title _____

Company _____ Dept./MS _____

Address _____ City _____

State&Zip _____ Phone _____

Form 0163-1181A

Repair Tag

Repair Authorization Number _____

Model

Serial

Number

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☐ Warranty repair ☐ Dead on arrival ☐ Repair ☐ Modification ☐ Recalibration

Symptoms: _____

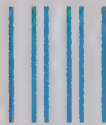


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Company _____ Dept./MS _____

Address _____ City _____

State&Zip _____ Phone _____



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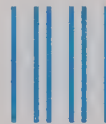
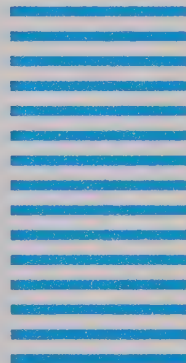
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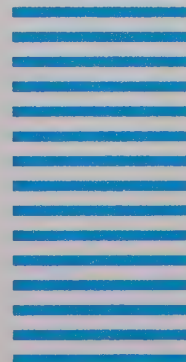
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attn: Customer Service

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